37 In which reactions is the major product formed by a nucleophilic substitution reaction?

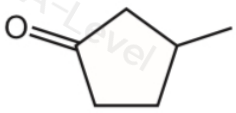
1 bromoethane + potassium cyanide in ethanol

2 bromoethane + ammonia in ethanol under pressure

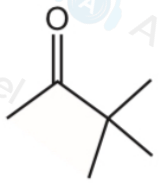
3 bromoethane + hot concentrated sodium hydroxide in ethanol

25 Which compound has the molecular formula $C_6H_{10}O$?

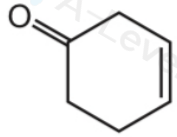
A



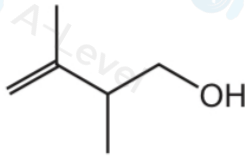
B



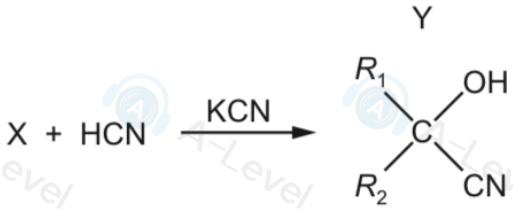
C



D



26 The diagram shows the formation of compound Y from compound X in a chemical reaction. R_1 and R_2 are alkyl groups.



Which row about this reaction is correct?

	mechanism	compound X
A	electrophilic addition	aldehyde
B	electrophilic addition	ketone
C	nucleophilic addition	ketone
D	nucleophilic addition	aldehyde

27 How many isomeric esters have the molecular formula $C_4H_8O_2$?

A 2 **B** 3 **C** 4 **D** 5

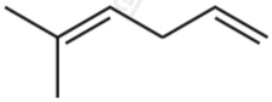
40 Which statements comparing ethene and ethane are correct?

1 The bond angles in ethene are larger than the bond angles in ethane.

2 Ethene reacts much more quickly with bromine in the dark than ethane does.

3 Complete combustion of 0.01 mol of ethene or ethane produces the same volume of gas measured at room temperature and pressure.

30 The alkene shown reacts with an excess of HBr via an electrophilic addition reaction.



What is the **major** product formed?

A 3,5-dibromo-2-methylhexane

B 2,5-dibromo-2-methylhexane

C 2,6-dibromo-2-methylhexane

D 3,6-dibromo-2-methylhexane

29 Which reaction gives butanoic acid as one of its products?

A acid hydrolysis of butyl ethanoate

B alkaline hydrolysis of butyl ethanoate

C acid hydrolysis of ethyl butanoate

D alkaline hydrolysis of ethyl butanoate

39 The formula shows the repeat unit of an addition polymer.

$$-CH(CH_3)CH(CH_2CH_3)-$$

What is the correct name of the monomer from which this polymer is made?

A 1-methyl-2-ethylethene

B 1-ethylprop-1-ene

C pent-2-ene

D pent-1-ene

33 X, Y and Z are three isomeric alcohols.

X $CH_3CH_2CH_2CH_2CH_2OH$

Y $CH_3CH_2CH(OH)CH_2CH_3$

Z $(CH_3)_2C(OH)CH_2CH_3$

Separate samples of each alcohol are warmed with a mild oxidising agent and the results noted.

One of these alcohols, when dehydrated, will give a pair of cis-trans isomers with molecular formula C_5H_{10}.

Which row is correct?

	reacts with mild oxidising reagents	gives cis/trans isomers
A	X, Y and Z	Y only
B	X, Y and Z	Z only
C	X and Y only	Y only
D	X and Y only	Z only

28 Ethene reacts with aqueous bromine to give two products, CH_2BrCH_2Br and CH_2BrCH_2OH.

Which statement about these products is correct?

A Both products are obtained in this reaction by nucleophilic substitution.

B Both products are obtained in this reaction by nucleophilic addition.

C Both products can be hydrolysed to form the same organic compound.

D Both products can form hydrogen bonds with water.

27 In this question you can assume that ^{1}H and ^{3}H have the same chemical properties.

A sample of ethanal contains only one isotope of hydrogen, ^{1}H.

It is reduced to compound Z, C_2H_6O, in a nucleophilic addition reaction using $NaBH_4$. All the hydrogen atoms in the $NaBH_4$ are the ^{3}H isotope.

$$CH_3CHO \xrightarrow{NaBH_4} \underset{\text{compound Z}}{C_2H_6O}$$

Compound Z is then oxidised back to ethanal and water.

$$C_2H_6O + [O] \rightarrow CH_3CHO + H_2O$$

Which statement about the final mixture of products is correct?

A Both ethanal and water contain ^{3}H atoms.

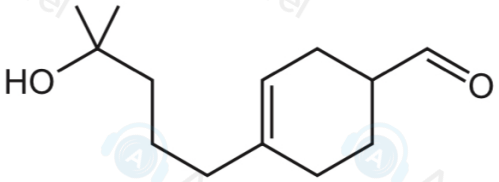
B Ethanal is the only product containing ^{3}H atoms.

C Neither ethanal nor water contain ^{3}H atoms.

D Water is the only product containing ^{3}H atoms.

38 Which compounds will produce a yellow precipitate with alkaline aqueous iodine?

1



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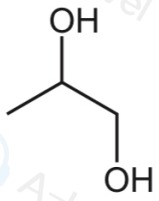

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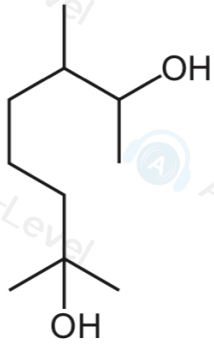
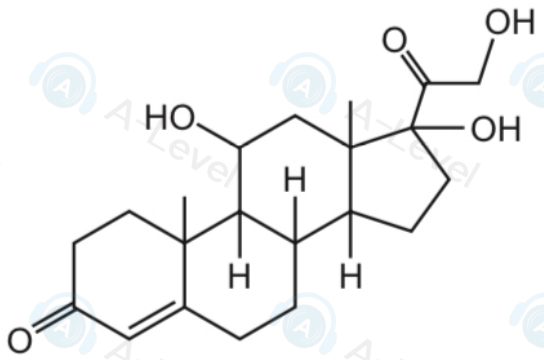


30 In the hydrolysis of bromoethane by aqueous NaOH, what is the nature of the attacking group and of the leaving group?

	attacking group	leaving group
A	electrophile	electrophile
B	electrophile	nucleophile
C	nucleophile	electrophile
D	nucleophile	nucleophile

37 Cortisone is a synthetic hormone.

cortisone



Which classes of alcohol does this molecule contain?

1 primary alcohol

2 secondary alcohol

3 tertiary alcohol

39 Which of the reactions give products containing a chiral centre?

1 $CH_2(OH)COCO_2H$ + an excess of HCN

2 $CH_2(OH)COCO_2H$ + an excess of $NaBH_4$

3 $CH_2(OH)COCO_2H$ + an excess of $LiAlH_4$

35 1-bromopropane reacts with hot ethanolic NaOH.

What is the molecular formula of the product in this reaction?

A C_3H_6 **B** C_3H_8 **C** C_3H_7O **D** C_3H_8O

27 Compound X, $C_5H_{10}O_3$, has one chiral carbon atom per molecule. Compound X produces bubbles with Na but **not** with Na_2CO_3.

Which formula could represent compound X?

A $(CH_3)_2C(OH)CO_2CH_3$

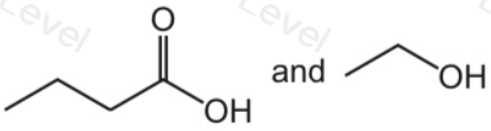
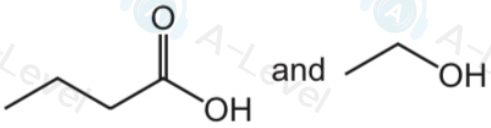
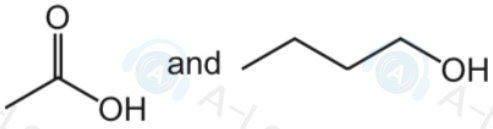
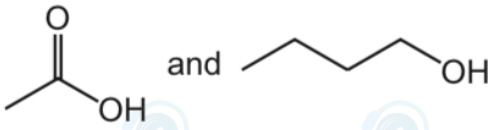
B $HOCH_2CH(CH_3)CO_2CH_3$

C $CH_3CH_2C(CH_3)(OH)CO_2H$

D $CH_3CH(OH)CH(CH_3)CO_2H$

38 Ethyl butanoate is a flavouring, with a fruity flavour.

Which row is correct?

	alcohol and acid that react to form ethyl butanoate	the mass of water formed when 2.32 g of ester is formed
A		0.36 g
B		0.40 g
C		0.36 g
D		0.40 g

27 Compound X can be oxidised to compound Y.

Compound Y gives a yellow precipitate with alkaline $I_2(aq)$.

What is compound X?

A butan-1-ol

B butan-2-ol

C methylpropan-1-ol

D methylpropan-2-ol

29 Which statement is correct?

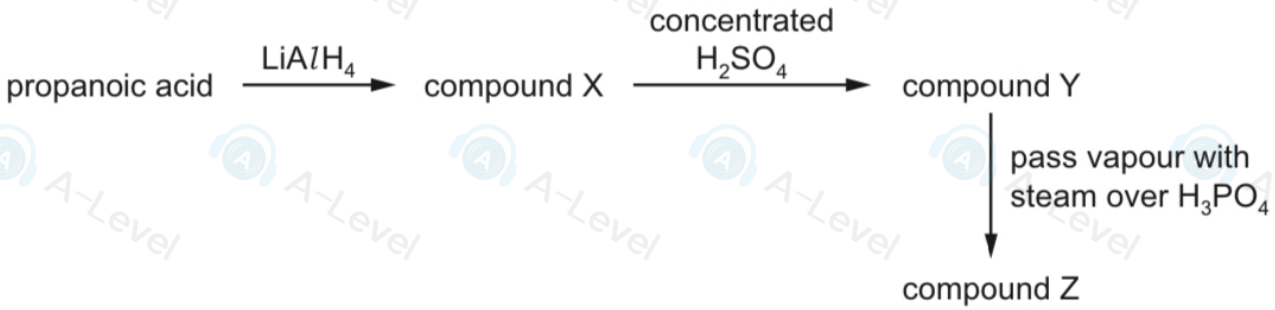
A Bromoethane reacts with NaOH(aq) to form ethene as a major product.

B 1-chlorobutane reacts more rapidly than 1-bromobutane with NaOH(aq) at the same temperature.

C Hydrolysis of $(C_2H_5)_3CBr$ occurs mostly by the S_N2 mechanism.

D The $CH_3CH_2CH_2CH_2^+$ ion is less stable than the $(CH_3)_3C^+$ ion.

28 A sequence of reactions takes place. The major product is compound Z.



What is compound Z?

A propanone

B propene

C propan-1-ol

D propan-2-ol

38 Which reaction will form propanoic acid?

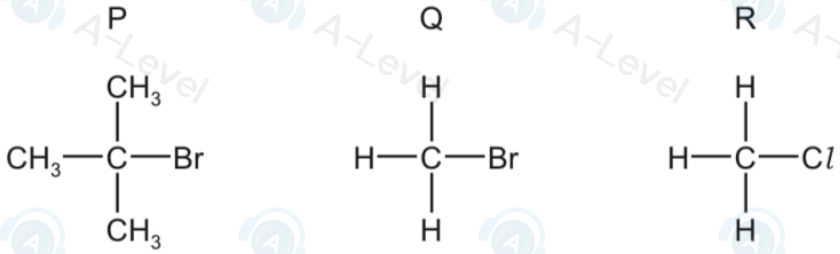
A acidic hydrolysis of propyl ethanoate

B alkaline hydrolysis of ethyl propanoate

C acidic hydrolysis of propanenitrile

D acidic hydrolysis of ethanenitrile

30 The diagram shows the structures of three halogenoalkanes.



P, Q and R can all be hydrolysed.

Which row is correct?

	relative speed of hydrolysis		mechanism of hydrolysis	
	Q	R	P	Q
A	fast	slow	S_N1	S_N2
B	fast	slow	S_N2	S_N1
C	slow	fast	S_N1	S_N2
D	slow	fast	S_N2	S_N1

20 Which pair of compounds are functional group isomers of each other?

A butan-1-ol and butanal

B ethylpropanoate and pentanoic acid

C hex-1-ene and hex-2-ene

D propylamine and propanenitrile

33 Which compound gives both:

- an orange precipitate with 2,4-DNPH reagent
- **and** a yellow precipitate with alkaline $I_2(aq)$?

A ethanol

B methanal

C propanal

D propanone

39 Which statements apply to tetrafluoromethane?

1 It is rapidly decomposed by ultraviolet radiation.

2 It is less harmful to the ozone layer than dichlorodifluoromethane.

3 It is a non-polar molecule.

36 A sample of pent-2-en-4-ol, $C_5H_{10}O$, contains all the possible stereoisomers of this compound.

How many stereoisomers are there in the sample?

A 2 **B** 3 **C** 4 **D** 5

28 Which statement about the use of alkane fuels in internal combustion engines is correct?

A C_8H_{18} is used as fuel in internal combustion engines and reacts with oxygen and nitrogen from the air.

B In limited oxygen, CO is produced which oxidises SO_2 to SO_3 in the atmosphere.

C The catalytic converter removes polluting gases including NO_2 and CO_2.

D Unburnt hydrocarbons and NO_2 can react in sunlight to produce photochemical smog.

34 Which alcohol reacts with alkaline $I_2(aq)$ to produce ethanoate ions?

A ethanol

B methylpropan-2-ol

C propan-2-ol

D butan-2-ol

21 How many tertiary alcohols have the molecular formula $C_6H_{14}O$?

A 1 **B** 2 **C** 3 **D** 4

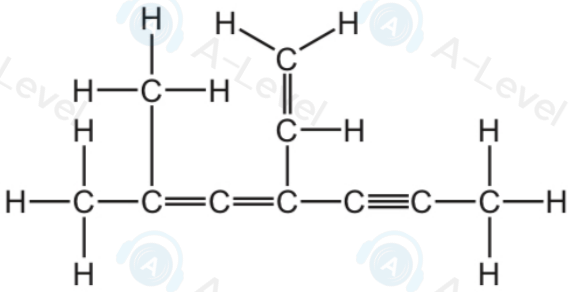
26 In this question, alkenes and cyclic alkanes should be considered.

How many **structural** isomers of C_4H_8 are there?

A 3 **B** 4 **C** 5 **D** 6

25 The diagram shows the structural formula of a hydrocarbon molecule Q.

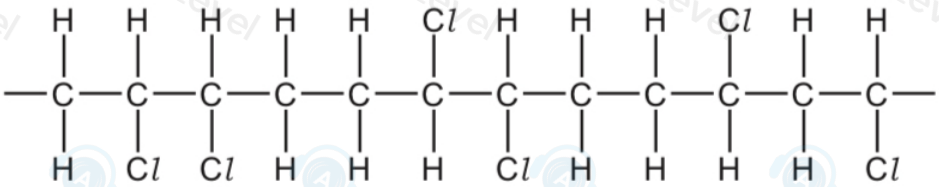
molecule Q



How many of the carbon atoms in molecule Q are sp^2 hybridised?

A 3 **B** 4 **C** 7 **D** 10

37 A molecule of a polymer contains the sequence shown.



Which monomer could produce this polymer by addition polymerisation?

A CHCl=CHCl

B CH_2=CHCl

C CH_3CCl=CHCl

D CH_3CCl=CH_2